

What is Claimed is:

1. An abrasive composite material comprising a matrix, abrasive grains, and carbon fiber having a multi-layer structure, each fiber filament of the carbon fiber having an outer diameter of about 2 to about 500 nm and an aspect ratio of about 5 to about 15,000, and including a hollow space extending along its center axis.

2. An abrasive composite material according to claim 1, wherein the carbon fiber has a BET specific surface area of at least about 4 m²/g.

3. An abrasive composite material according to claim 1, wherein the carbon fiber has, at a carbon (002) plane, an interlayer distance (d_{002}) of about 0.345 nm or less as measured by means of X-ray diffractometry.

4. An abrasive composite material according to claim 1, wherein the ratio of the peak height (I_d) of the band at 1,341 to 1,349 cm⁻¹ in a Raman scattering spectrum of the carbon fiber to the peak height (I_g) of the band at 1,570 to 1,578 cm⁻¹ in the spectrum; i.e., I_d/I_g , is about 1.5 or less.

5. An abrasive composite material according to claim 1, wherein the carbon fiber contains branched vapor grown carbon fiber.

6. An abrasive composite material according to claim 1, wherein boron is contained, in an amount of about 0.01 to about 5 mass%, in the interior of crystals constituting the carbon fiber.

7. An abrasive composite material according to claim 1,

wherein the amount of the carbon fiber is about 2 to about 40 vol.% with respect to the abrasive composite material.

8. An abrasive composite material according to claim 1, wherein the abrasive grains are formed of at least one material selected from among cerium oxide, silicon oxide, silicon carbide, boron carbide, boron nitride, zirconium oxide, diamond, and sapphire.

9. An abrasive composite material according to claim 1, wherein the matrix is formed of at least one material selected from among a resin, a metal, and a ceramic material.

10. An abrasive composite material according to claim 9, wherein the resin contains at least one species selected from among a phenolic resin, a melamine resin, a polyurethane resin, an epoxy resin, a urea resin, an unsaturated polyester resin, a silicone resin, a polyimide resin, an epoxy resin, a cyanate ester resin, and a benzoxazine resin.

11. A grinding wheel formed through molding of an abrasive composite material as recited in claim 1.

12. A grinding material comprising an abrasive composite material as recited in claim 1.

13. A polishing material comprising an abrasive composite material as recited in claim 1.

14. A cutting tool material comprising an abrasive composite material as recited in claim 1.

15. A cutting tool material according to claim 14, wherein the matrix contains the carbon fiber in an amount of about 20 to about 45 vol.%.

16. A wire-cut electrical discharge machining material comprising a cutting tool material as recited in claim 14.

17. A wire-cut electrical discharge machining method employing a cutting tool material as recited in claim 14.

18. A method for producing a cutting tool, which employs a wire-cut electrical discharge machining method as recited in claim 17.

19. A method for producing an electronic part, which method comprises a step of grinding at least one species selected from among a semiconductor, an interlayer insulating film, and a wiring material by use of an abrasive composite material as recited in claim 1.

20. A method for producing an electronic part, which method comprises a step of polishing at least one species selected from among a semiconductor, an interlayer insulating film, and a wiring material by use of an abrasive composite material as recited in claim 1.

21. A method for producing an electronic part according to claim 19 or 20, wherein the semiconductor is at least one species selected from among polycrystalline silicon, single-crystal silicon, and amorphous silicon.